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President----------R. Wallace Mitchell
Campbell System, Kansas City, Missouri

Vice President and Business Manager----------L. A. Lawellin
Eagle Roller Mills, New Ulm, Minn.

Secretary and Treasurer----------C. J. Patterson
Campbell System, Kansas City, Missouri

Editor----------J. R. Hess
Reno Flour Mills Co., Hutchinson, Kansas

Address all articles for publication to J. R. Hess,
The Reno Flour Mills Co., Hutchinson, Kansas

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OF THE

AMERICAN ASSOCIATION

OF

CEREAL CHEMISTS

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TO THE CEREAL CHEMIST

No, I haven't received any inquiries as to research work. The chemists seem to want to keep everything they know about wheat to themselves. I would sure like to ask them a few questions.

Isn't it peculiar that we make flour from a material that we know very little about?

How far would the rubber manufacturer get, in these days, if he did not know more about his materials than we do?

The rubber manufacturer gets lots of information from Sp. Gr.

Did you ever think that might help in the determination of the value of a flour? What is the Sp. Gr. of flour? Huh! Does it vary? If so, why?

How far would the steel manufacturer get if he didn't know what he was using to make his steels. Suppose he were to buy a carload of iron and all he knew was the % Fe. What kind of a steel would he get if he just threw it into the furnace without knowing the amount of carbon and phosphorus, etc? These ingredients are present in the iron in very small amounts. Did any one ever think of the mineral that is present in very small amounts in wheat or possibly other ingredients that haven't been determined? How about Ca and Mg?

We know what effect lime water has on a dough, or do we?

We know the effect of washing gluten in distilled water or salt water.

How about a Ca-Mg ratio?

How do you know there is nothing to it? Have you tried it carefully?

Is our determination of protein of any great value?

Does the ratio of washed gluten and the total protein always hold the same? Does it vary with different wheats?

Will spring wheat, hard winter, soft wheat, durum and red turkey of

the same per cent protein bake the same? Why?

Which gives us the best bake? No. 1, 2, 3, 4, 5, hard winter?

Does it? How do you know? Have you tried it?

There surely must be a best way for the determination of protein. What is it?

What effect has copper or copper sulfate during the digestion and on the total nitrogen? Does it have any?

Does long temper improve or injure a wheat? Which bakes the best? What happens when you temper a wheat, besides the loosening of the bran coat and making the buyer of flour buy water? Is the reason you temper because the boss wants to make that extra money?

The wheat kernel is a colloid, isn't it?

Is the amount of protein a criterion as to value? If not, why do we blend as to amount?

Is all 2 hard winter wheat of the same grade the same? Then why do we blend according to the test weight? Is all hard winter or spring of the same grades the same? Then why blend according to kind? Do you always know the quality of the gluten when you blend?

Will two wheats, of same analysis and appearance bake alike?

What is the cause of the gray color in Colorado wheat? Can it be remedied? Why is the spring wheat grayish in cast while hard winter grown on the next 40 acres will be creamy?

What relation has phosporus or phosphates to baking quality?

Does it have any relation? How do you know?

What is present in wheat as received? Do we know? We do not.

Does its composition change during storage? How do you know?

How about the sugars? Kinds of sugars? Do the kinds of sugars present determine the baking value?

Did you ever try a series of slack dough fermentations? Why is it some flours wil give higher raise and "come back" more times and still not bake a good loaf?

I acknowledge I am ignorant of these things and many others. I imagine there are others in the same boat. If you know write it up. It may seem simple to you, but let us dense ones know if *you* know.

J. R. Hess.

REMARKS BY MR. ROOS AT ANNUAL BANQUET

Ten chemists employed in laboratories in Missouri. Kansas and Oklahoma, devoted to cereal research, met in Kansas City on May 8, 1915, and organized the American Association of Cereal Chemists. This association was the culmination of a desire to introduce more uniform methods of conducting chemical investigations and to have the laboratory men work along similar lines in the testing of flour and mill products and the baking of bread.

H. E. Weaver was selected as president of the association; A. R. Sasse as vice president, and P. M. Patterson as secretary-treasurer. C. J. Patterson became chairman of the executive committee, whose other members were R. A. Lusk and A. A. Jones. R. Wallace Mitchell was selected as editor. E. G. Wahlin, J. M. Hogan and C. F. Buck were the privates in the ranks.

It was my pleasure to be a privileged character who was permitted to be present at the first banquet of the association and assist in suggesting names for the infant and to comment on the constitution.

Numerical strength was not one of the prime desires of the organization but rather a select body which would inspire confidence and bring credit to the profession.

The Association has accomplished what it first set out to do, viz. bringing about uniformity in methods. It has created for itself a recognized standing.

There are open to you, both as an association and as individuals, still many avenues of progress. Principal of these are the avenues which will tend to creating a greater appreciation of your services by the firms whom you serve.

I believe that few mills realize the asset they possess in their laboratory and all of them fail to take advantage of the opportunities that are open to them through research work.

As individuals, it is to your interest to present these opportunities forcibly to your employers. Go beyond your regular routine work. If you have run over the entire line of mill streams, give a little attention to the screenings pile; study the water that is used in milling; try out the oil and grease; get acquainted with the coal pile and do not overlook the ash heap. There are many places where you can put your ingenuity to work but it will be necessary for you to present something tangible that will drive home the fact that your time was profitably employed.

As an association, it is to your interest to foster research work along the lines indicated in the preceding remarks. You could lay out certain lines of investigations to be carried out by all your members at certain periods of the year. Let us say that one month you make a special study of the streams of the mill; another month take up tempering as a special topic another month investigate lubricants and in this manner carry on a concerted work which will create the interest of the employer as it will enable him to have presented for his consideration, comparisons of conditions existing in other plants.

Your greatest avenue of progress will be in meeting frequently, getting to know each other thoroughly and thus be enabled to exchange experiences and confidences.

HUGO ROOS.

ACCURACY OF ASH DETERMINATIONS

"Ash Test For Flour" is the caption of an article by Harry Snyder, Chief Chemist of the Russell Miller Milling Co., in the American Miller for June 1, 1920, p. 627. Mr. Snyder quotes results of co-operative ash tests of the Association of Official Agricultural Chemists on the same sample of flour by seven to nine analysts and who could not agree closer than 0.047% to 0.062% ash when using the same method. These analysts also showed as much as 0.12% difference in ash when the calcium acetate method was used. Mr. Snyder gives in explanation for these large variations three causes as follows:- (1) Variations in moisture content. (2) Incomplete combustion. (3) Tolerance in analytical weights.

It is certainly to be regreted that such a reputable body as the Association of Official Agricultural Chemists, has referee operatives who are not able to produce closer aggreement in these tests. We would not be surprised at all that such wide variations would be found by the six weeks grade school graduates of our so called milling chemistry institutions of technology and we might make some further comments on methods employed in burning flour for ash such as difference in gas muffle and open flame reduction as against the electric muffle burning method adopted by the American Association of Cereal Chemists. The members of this Association have time and again handed samples of the same flour to six or eight other

members and have shown no greater variation than 0.017%. The tolerance of weights is the only excuse for error in an ash determination beyond ordinary limits of experimental error. Incomplete combustion or fusing seems to be a ridiculous ground for error on the part of a trained analyst as well as the statement that the difference in moisture content was responsible for error observed. All results of the American Association of Cereal Chemists are stated on 13.5% moisture basis. The statement that chemists can not make an ash determination check close enough to be of value is ridiculous.

While we are on the subject of checking, which is always interesting, we would like to mention that on a check test six analysts in the A. A. C. C. this spring, using the same flour reported a total maximum difference of 0.17% in the determination of protein. There are some determinations such as loaf volume of bread which are influenced by technique and are not as easily checked since the methods are not completely standardized, but in the hands of the skilled analyst, quantitative and volumetric analysis are as accurate as theory.

A. A. JONES.

THE KANSAS CITY MEETING

The annual meeting of the American Association of Cereal Chemists was held at the Coates House, Kansas City, Mo., May 27, 28, and 29, 1920. The following members were present:

R. J. Clark	L. H. McLaren
C. F. Buck	M. C. Mann
R. V. McVey	H. F. Vaupel
R. A. Lusk	J. C. Wood
A. A. Jones	J. M. McCaddon
J. R. Hess	M. E. Schultz
S. J. Lawellin	R. Potts
F. D. Patterson	A. R. Sasse
O. W. Harper	A. W. Estabrook
Fred Loomis	R. S. Herman
J. M. Hogan	G. S. Lyman
C. J. Patterson	R. W. Mitchell

Visitors:

C. Ward	H. L. Thompson
C. Fisher	John Manning
Mr. Heon	Miss Z. Z. Titus

Miss Bernice Ream

New members:

H. H. Johnson, Ismert-Hincke Mlg. Co., Topeka, Kans.

J. William Barker, Larabee Flour Mills Co., Marysville, Kans.

M. C. Mann, Consolidated Flour Mills Co., Hutchinson, Kans.

W. L. Rainey, Wm. Kelly Milling Co., Hutchinson, Kans.

Ralph Morgan, Kansas Milling Co., Wichita, Kans.

R. Alex Brink, Western Canada Flour Mills Co., Winnipeg, Man., Can.

G. S. Alexander, Ismert-Hincke Mlg. Co., Kansas City, Mo.

The Sixth Annual Meeting was called to order by President R. W. Mitchell, May 27th, 10 A. M., Coates House, Kansas City, Mo.

The president requested an earnest endeavor from all members to take an active part for the welfare of the association and the development of new methods which may in the future be adopted as official methods of the association. He pointed out the necessity of more research work and closer cooperation by and among all members, and also the need of a standard baking formula. He asked that the association might obtain a memo of methods, and encourage the reporting of small details on methods that may give collective results. He spoke of the members forgetting their part in obtaining sustaining membership.

Secretary's report read and accepted.

Mr. C. F. Buck, assistant editor.

reports insufficient material for a Journal at the present time, and he made the suggestion that he would like to publish at least two Journals a year.

Motion. If sustaining members are not heard from within thirty days from date, May 27, 1920, secretary should send statement. Motion lost.

Amendment. Secretary or business manager to send statement to sustaining members. Lost.

Motion. Each member of the American Association of Cereal Chemists is to obtain sustaining membership from their respective company, after which time the secretary and treasurer is to send statement for renewal. Carried.

Motion to raise dues of members from $2 per year, present rate, to $5 per year. Action postponed until Friday.

AFTERNOON SESSION.

The following papers were read:

"To the Cereal Chemist," by J. R. Hess.

"A New Method for the Determination of Gluten," by S. J. Lawellin.

"The Status of the Chemist in the Baking Industry," by C. J. Patterson.

Symposium on "Methods for Acidity Determination in Flour."

H. E. Weaver, chairman of the executive committee, passed on twelve new members during the year.

Present meeting place decided upon by the president.

Different forms of bulletin discussed—such as loose leaf bulletin being printed at more regular and more frequent intervals.

FRIDAY MORNING.

Meeting called to order by president at 10 A. M.

Minutes of last year's meeting were read and accepted.

Section in the American Chemical Society laid over until Saturady.

Motion to change dues from $2 to $5 per year made, seconded and carried.

Amendment to constitution for raising membership fee from $5 to $10 after June 1, 1920. Carried unanimously.

Election of officers.

R. W. Mitchell was re-elected president.

S. J. Lawellin was elected vice-president and business manager.

C. J. Patterson was re-elected secretary and treasurer.

R. A. Lusk elected chairman executive committee.

J. R Hess elected editor.

Executive committee appointed: R. B. Potts, H. F. Vampel, L. E. Leatherock.

J. R. Hess, chairman of the research committee, spoke of no co-operation among members and of having plenty of work for members to do in the way of research, as suggested. He pointed out the value of work done in the flour mill other than ash, moisture, protein and baking test.

Discussion on the method of obtaining moisture content of wheat going to the rolls.

F. D. Patterson has calibrated tanks which check within twelve pounds of measurement. He advises blending at certain seasons according to moisture content and checks weight of dry wheat and tempered wheat.

Monthly overage due to moisture, obtained by 50 per cent of the members.

Short discussion on acidity determination.

AFTERNOON SESSION.

Meeting called to order at 2:25 P. M.

Names of new members were read.

A very interesting paper was read by Forrest Anderson on possible means of overcoming the barrier existing in the milling industry among

managers, head millers and head chemists.

Report on visits to Northwestern Laboratories by S. J. Lawellin.

Adjourned for a trip to the Campbell System Laboratory.

SATURDAY MORNING.

Meeting called to order at 10 A. M.

Paper by H. E. Weaver and J. C. Wood—"Enzymic Action on Wheat Flour Solutions and their Effect in Bread."

This was a most interesting paper and was followed by a very enthusiastic discussion.

Paper by A. W. Estabrook on laboratory ideas.

Paper by R. B. Potts on historical milling and baking as given by Peter Kozman.

Adjourned.

AFTERNOON SESSION.

Meeting called to order at 1:30 P. M. by vice-president.

Mr. Hess asked for an associate editor.

Motion made by H. E. Weaver that an associate editor be created and that the editor have the authority to appoint the associate editor. Motion carried.

Editor suggested several changes in the bulletin, and made an earnest endeavor to put before the members that it was their efforts and not his alone that would put over a bulletin worthy of the association and desired enough material for at least four bulletins a year. He asked for abstracts on books, articles and new apparatus.

Discussion on crude fiber.

Committee appointed R. S. Herman, as chairman, to draw up a method as the official method of the association for the determination of crude fiber.

The method as reported by the committee read as follows:

One filtration method for the determination of crude fiber.

Weigh out two grams of the finely ground sample, dry, extract fat, transfer to a 500 cc. receptacle, to which a reflex condenser is attached, add 200 cc. of boiling 1.25 per cent sulphuric acid, boil for thirty minutes, add 200 cc. 3.25 per cent solution of NaOH, boil for thirty minutes, make solution slightly acid and filter on an Alundum or Gooch crucible, wash until filtrate is neutral, place in drying oven and dry to constant weight, cool, weigh and incinerate in muffle. Loss in weight is calculated as crude fiber.

Motion made, moved and seconded that this be adopted as the official method of the American Association of Cereal Chemists. Motion carried 21 to 4.

Discussion on acidity.

H. E. Weaver, chairman of committee.

Committee recommends the following method for the determination of acidity in flour:

10 grams of flour, dissolved in 250 cc. of distilled water free from carbon dioxide, digested for two hours at 40° centigrade, centifuge and filter. 25 cc. aliquot to be titrated with N/20 sodium hydroxide, using 2 cc. of carefully neutralized phenolphthalin as an indicator, titrating to initial pink. This differs from the tentative method in the previous bulletin in its ratio of water to flour.

Moved and seconded by A. R. Sasse that this method be accepted as the official method of the American Association of Cereal Chemists.

Carried.

Motion by Wood that all official methods be published in loose leaf form and distributed to the members of the association. Carried.

Amendment by Weaver that this bulletin also include the tentative methods. Carried.

Motion by Wood that the editor and associate editor publish and distribute all loose leaf bulletins and publications. Motion carried.

H. E. Weaver read Article 3 of

the constitution, regarding honorary membership, and moved that Hugo Roos be elected as honorary member. Carried unanimously.

Moved by J. R. Hess that Mr. Theodore F. Ismert be elected honorary member. Carried unanimously.

Moved that a committee be appointed to notify Mr. Ismert of his election. Carried. Committee appointed. C. J. Patterson, R. J. Clark.

Suggestion by Roos that all methods used by members be stamped as official methods of A. A. C. C. on their reports.

Moved by McLaren that officers of the association make up stamps in Kansas City for the above purpose and bill same to each member. Carried.

Moved by Lawellin that a committee of three be appointed to work methods for the determination of all soluble constituents of flour and report on same at our next meeting. From this work official methods are to be compiled and adopted. Motion carried. Committee, S. J. Lawellin, H. E. Weaver, L. H. McLaren.

H. E. Weaver suggested that all visitors not coming up to the entrance qualifications of the association be permitted to become associate members.

It was suggested by Roos that sustaining members and visitors become associate members.

Moved by Weaver, as amendment to the constitution, that those male persons having five years experience in laboratory be admitted as associate members at a fee of $10 each. Their qualifications being determined by the executive committee. Such members are not to have any active part in the business meetings of the association. Amendment carried unanimously.

Moved by Lawellin that executive committee be made the membership committee and that they carry on a campaign for new members in allied industries.

The annual meeting adjourned.

A VOLUMETRIC METHOD FOR THE DETERMINATION OF SUGARS IN FLOUR

This method is a combination of the gravimetric determination of sugars by Fehlings Solution and the Kendall's method for the determination of copper.

Leach's method may be used as a guide as to the amounts of sugar solution and materials to use for the determination.

We used one gram of material (flour, ground wheat, etc.,) to 200 cc. of water. Kept down bacterial action by a few drops of toluene. Filtered solution and determined the sugar by the method described below:

The sugar solution is brought to a boil and 20 cc. of Fehlings solution added. If the solution becomes colorless add 5 cc. portions of Fehlings until blue color is permanent. Filter through prepared asbestos gooch. Wash with distilled water until filtrate is free from copper. Ascertain whether copper is present by use of NH_4OH. Note: We used suction pump in the filtering and washing.

The copper is obtained either as the oxid or as metalic copper. Whether obtained as oxid or metallic copper, it can be determined by this method.

If obtained as metallic copper, it is dissolved with 10 to 15 cc. of a 50 per cent HNO_3 solution into a 300 cc. erlenmeyer flask.

If obtained as oxid it is dissolved with 10 to 15 cc. of a 50 per cent HNO_3 solution into a 300 cc. erlenmeyer flask.

Note: This acid added directly to

the gooch and washed thoroughly with distilled water. Wash until free from copper. This can be tested as in the above.

The nitric acid solution thus obtained is treated with 5 cc. of Sodium Hypochlorite solution and well mixed. Let this mixture stand for at least two minutes and add 10 cc. of a 5 per cent phenol solution as quickly as possible. We used a pipette with the tip broken off so as to deliver as quickly as possible. A 20 per cent solution of NaOH is then added until a very slight precipitate forms. Made slightly acid with acetic acid (50 per cent). Add 10 cc. of 30 per cent potassium iodide solution and about 2 cc. of soluble starch solution. Titrate with tenth normal solution of sodium thiosulphate.

Note: In dissolving the copper in nitric acid, nitrous acid is formed. This nitrous acid must be removed. This can be done by treating with hypochlorite. Sodium hypochlorite plus nitric acid react to form hydrochloric acid in the presence of nitrous acid. This HCl in turn reacts with hypochlorous acid to form chlorine. This chlorine is removed by the addition of the phenol solution to form chlorophenol; unless the phenol is added very quickly the chlorine will oxidize instead of entering the benzene ring and thus interfere with the determination of the copper. There should be no yellow fumes or odor of chlorine in the flask just before solution is made alkaline. These fumes can be blown out of the flask. No less than 3 grams of KI should be used to each determination.

SOLUTIONS REQUIRED.

N/10 Sodium Thiosulphate Solution.

5 per cent Solution of Phenol.

20 per cent Solution of Sodium Hydroxide.

50 per cent Solution of Acetic Acid.

30 per cent Solution of Potassium Iodide.

Sodium Hypochlorite solution.

Soluble Starch.

Fehlings Solution.

SODIUM HYPOCHLORITE SOLUTION.

The sodium hypochlorite solution is made by boiling 112 grams of calcium hypochlorite with 100 grams of sodium carbonate made up to about 1200 cc. Boil for about half an hour. Filter

Standardize by taking 5 cc. of the filtrate in 100 cc. of distilled water. Add 5cc. of 30 per cent KI solution, and a few cc. of hydrochloric acid. Dilute and titrate with N/10 sodium thiosulphate. Adjust so that 5 cc. of hypochlorite equals 30 cc. of N/10 thiosulphate.

Two methods can be used in standardizing a sodium thiosulphate solution to determine its copper equivalent.

A very good method is to use a known weight of pure metallic copper and using the above method for its determination. The more convenient method of standardization is to obtain its copper equivalent by the use of acid potassium iodate. KIO_3. HIO_3. The normal solution of this acid iodate is equal to 1/12 of the molecular weight in grams, per liter. Dissolve 3.249 grams in one liter of distilled water. Take 10 cc. of the acid iodate to 150 cc. of water and 1 cc. of HCl (dilute). Upon the addition of KI solution iodine will be liberated. The weight of copper to which 20 cc. of this iodate is equivalent is accurately determined. Then the Thio-copper equivalent can be determined at any time.. for the iodate remains constant indefinitely.

J. R. HESS.

Attention, Members: The next Journal will be out in October. Have your papers, abstracts, notes, etc., in the hands of the Editor not later than the 15th of September. Let us have a paper from every member.

EXPERIMENT ON SUGGESTED METHOD FOR DETERMINATION OF GLUTEN BY DISSOLVING IN ACETIC ACID

I.

Realizing the crude and unscientific principles involved in the ordinary methods of obtaining gluten from flour by the usual process of washing, Marchadier and Goujon, two French chemists working in collaboration, suggested taking advantage of the solubility of true gluten in strong acids and alkalies.

In their experiments they considered the proteins in general as the true glutens. Generally speaking only the gliadin and glutenin are classified as the true glutens, the other proteins present being classified as proteins. In the following paper only the gliadin and glutenin will be considered and spoken of as the true glutens.

In making these experiments it was desired to prove or disprove two questions:

1. Can a quantitative determination of true glutens or total proteins be made by making use of their solubilities in concentrated acids and alkalies?

2. Can the method be so perfected as to be of any value in the daily routine control work as met with in the laboratories of flouring mills?

II.

Glutenin and gliadin are generally spoken of as the insoluble proteins or true glutens. Gliadin is probably the sole alcohol soluble protein of wheat, though this has been in the past a point of controversy.

Pure gliadin is very soluble in distilled water forming opalescent solutions. Allen makes the statement that gliadin readily dissolves in very dilute acid or alkali but is precipitated unchanged on neutralization and is sparingly soluble in water containing salts.

While the solubility of gliadin in 70 per cent (by volume) alcohol is recognized, the glutenin has been generally determined heretofore by difference between the total proteins and the sum of the alcohol, water and salt soluble proteins. While this method is theoretically correct and gives fair results, still it would be of advantage to be able to determine the glutenin directly, either with or without the gliadin.

It is the gliadin-glutenin combination, more than any other constituents, that determines the quality of flour. A high percentage of the soluble proteins, edestin, leucosin, and enzymes, is not desirable in flour while just the reverse is the case with the insoluble proteins. The determination of either gliadin or glutenin alone is of uncertain value to the cereal chemist. Gluten is composed of gliadin and glutenin in approximately equal quantities. It has been suggested that the ratio of gliadin to glutenin or to the total protein of the flour influences the quality of gluten and affords a measure of strength. While the last statement is disputed the separation of the insoluble proteins and of the gliadin is still of importance.

In judging a flour the cereal chemist must have enough values to justify his drawing conclusions as to the value of the flour. Even with a complete analysis of a flour, exclusivley of separated proteins, it would hardly be safe to draw conclusions only in comparison with similar analyses on different flours.

However, with a complete analysis of a flour, supplemented with results for separated proteins, the cereal chemists can make a very accurate estimate of the the value of the flour. With results for separated proteins two of three possible values must be

must be given and from these two the third can be calculated easily. The protein value of most significance is the total protein. Second, in the opinion of the writer, comes the value or amount of true or insoluble proteins. Third is the amount of the soluble proteins. In the complete diagnosis of a flour as generally practiced, it has been the custom to determine the total proteins and the soluble proteins. The soluble proteins having been determined by two analyses making three for the complete analysis. Then, also, the second most important factor has been calculated. With the object of determining directly the two most important factors and calculating the least important this work has been undertaken.

III.

The centrifuge used in this work was a Babcock Official Milk Tester with trunion of four-bottle size. Into each carrier was fitted a special made glass centrifuge tube of 100 cc. capacity. These tubes were approximately 14 cm. in height and 3½ cm. in diameter. Centrifuge was run by hand power at near 75 R. P. M.

The crystallizing dishes used were of glass, size 0, 3 cm. in height and 5 cm. diameter, holding 50 cc. A more convenient form would be 5x5 cm. as this would prevent creeping of acetic acid while heating.

The hot plate used was ordinary gas hot plate upon which was superimposed a slab of asbestos approximately ¼ inch in thickness.

After some experimenting Marchadier and Goujon suggested the use of glacial acetic acid and this was the reagent used in all experiments.

IV.

The exact procedure as outlined by Marchadier and Goujon is as follows: "Put into a centrifuge glass one gram of flour and 10 cc. acetic acid, mix well with a glass rod, then centrifuge for about five minutes and decant the clear gluten solution into a crystallizing dish 5 cm. high (to prevent the creeping of the AcOH); repeat the operation with another portion of AcOH, unite the solutions and evaporate on a water bath. Finally expose the residue to 100 degrees Centigrade in a drying oven. After cooling, weigh. The result times 100 gives the % of gluten.

Method No. 1. Into the centrifuge tubes were placed one gram samples of flour to be tested. These were weighed on balance in weighing scoop and transferred by means of a brush to the tubes. To each tube 10 cc. of glacial acetic were added. By means of a glass stirring rod the samples were thoroughly stirred being careful to break up all lumps and to get a homogeneous mixture. The samples were then allowed to stand ten minutes when they were again stirred and, after removing stirring rods, centrifuged at 75 R. P. M. for five minutes. The clear solution was then decanted into a tared crystallyzing dish, another 10 cc. portion of acetic acid added and the operation repeated. After the second centrifuging the second portion was decanted into the dish with the first. The crystallyzing dishes were then placed on hot plate which was kept just hot enough to cause gluten solution to simmer gently. Samples were watched closely near end of evaporation period and removed just before disappearance of liquid. Dishes were now placed in drying oven at 104 degrees Centigrade and dried for one hour. A longer period was tried on a few samples but apparently one hour was sufficient to remove all traces of the acetic acid. Samples were then placed in dessicator, allowed to cool and weighed. Weight of residue in milligrams is direct percentage.

Method No. 2. Method No. 2 was essentially the same as method No. 1 except that three ten cc. portions of the acid were used. All other operations were carried out exactly the

same as in the previous method.

The original method as suggested by Marchadier and Goujon gave such divergent results that it was thought the time element could be a possible cause of this and the two latter methods employed were intended to eliminate this feature and also to standardize each step in the determination. Some experimental work was done to determine the time limit and while the results obtained are not given, the methods used covered the main features discovered in this experimental work. The two methods were used to give a comparison with different amounts of acid and to attempt to prove that only a certain percentage of flour or its constituents is soluble in glacial acetic acid.

The residues remaining after the extraction by acetic acid and decantation, were washed into an 800 cc. Kjeldahl flask, evaporated almost to dryness, 15 grams pulverized sodium sulphate and 20 cc. concentrated sulphuric acid were added, and the protein remaining determined by the Kjeldahl-Gunning method.

After evaporation of the acetic acid from crystallizing dishes and subsequent weighing of the precipitate the residue was treated with 15 cc. concentrated sulphuric acid and allowed to stand over night. The residues were then washed into an 800 cc. Kjeldahl flask, using 1:1 sulphuric acid as a washing agent. 1.5 grams sodium sulphate were then added and the proteins determined by the Kjeldahl-Gunning method. These determinations were made as a check on the method under observation and as an indication of its efficiency.

Four flours of various grades were used in the experiments so as to give as wide a range as possible. These flours were: No. 1, a long patent wheaten flour; No. 2, a straight wheaten flour; No. 3, a first clear grade wheaten flour, and No. 4, a patent rye flour. A complete analysis was made on each of these flours which is given in Table No. 1. All flours were approximately of two weeks age and were thoroughly air dried. They were so chosen to avoid as much as possible any error made while weighing due to loss of moist ure. On several days during the experiments the moisture was taken on the flours and found to not vary beyond the limits of experimental error.

In the original method as outlined by Marchadier and Goujon it is recommended to evaporate samples on the water bath. This would undoubtedly give a gluten of nearer white color but is very impracticable. The boiling point of glacial acetic acid is from 117 to 118 degrees Centigrade. After four hours rapid boiling on water bath samples did not appear to have lost by evaporation. Evaporation on hot plate must be conducted under a good gas hood as the fumes given of are very strong and disagreeable and if many samples are being run there is some danger of slight acetic acid poisoning.

V

Table No. 1. Complete Analyses of Flours.

Sample Number	1	2	3	4
Moisture, per cent	10.64	11.00	10.25	10.28
Ash per cent (duplicates)	0.40	0.50	0.80	0.63
Nitrogen per cent (dup. av.)	1.815	1.85	2.32	1.33
Nx5.7 (Av. of dup.)	10.33	10.52	11.76	7.57
Nx6.25 (Av. dup)	11.33	11.54	12.91	8.31
Wet Gluten per cent	35.80	36.90	41.30	----
Dry Gluten per cent	11.40	11.80	13.10	----
Acidity per cent Lactic	0.04	0.05	0.07	0.06
Water Soluble Solids per cent	6.46	6.07	7.20	10.12

Water Soluble Protein per cent	1.34	1.405	1.66	2.39
Salt Soluble Protein per cent	1.995	1.795	2.43	2.75
Gliadin per cent	5.58	6.53	6.69	4.32

Table No. 2. Calculated Theoretical Proteins. Calculated from Analyses.

Sample Number	1	2	3	4
Total Protein per cent	10.33	10.52	11.76	7.57
Non-Gluten Protein per cent	1.725	1.525	2.16	2.48
True Glutens per cent	8.605	9.000	9.60	5.095
Gliadin per cent	5.580	6.530	6.690	4.320
Glutenin per cent	3.025	2.470	2.910	0.775
Edestin and Leucosin per cent	1.340	1.405	1.660	2.390
Amido Proteins per cent	0.385	0.120	0.500	0.090

Table No. 3. Results of Acetic Acid Extraction.

Method No. 1.

Sample Number	1		2		3		4	
	As Wgd.	Average	As Wgd.	Average	As Wgd.	Average	As Wgd.	Average
Trial No. 1	10.69		11.56		13.07		7.93	
	10.42	10.55	11.44	11.50	12.90	12.98	7.30	7.61
Trial No. 2	10.50		11.30		12.81		7.80	
	10.48	10.49	11.42	11.36	12.61	12.71	7.92	7.86
Trial No. 3	10.70		11.34		12.90		7.70	
	10.52	10.61	11.60	11.47	12.80	12.85	7.84	7.77

Method No. 2

Sample Number	1		2		3		4	
	As Wgd.	Average	As Wgd.	Average	As Wgd.	Average	As Wgd.	Average
Trial No. 1	10.45		11.50		12.60		8.10	
	10.76	10.40	11.49	11.49	12.70	12.65	8.02	8.06
Trial No. 2	19.71		11.62		12.65		8.10	
	10.72	10.71	11.90	11.76	12.31	12.48	7.78	7.94
Trial No. 3	10.79		11.40		12.80		7.70	
	10.95	10.87	11.62	11.51	12.90	12.85	7.92	7.81

Table No. 4. Protein on Extracted Residues.

Method No. 1.

Sample Number	1		2		3		4	
	As Titr.	Average	As Titr.	Average	As Titr.	Average	As Titr.	Average
Trial No. 1	1.110		1.150		1.180		0.800	
Nitrogen	1.110	1.110	1.140	1.145	1.190	1.185	0.800	0.800
Protein	6.33		6.55		6.72		4.56	
Nx5.7	6.33	6.33	6.50	6.525	6.78	6.75	4.56	4.56
Trial No. 2, Nitrogen	1.120		1.148		1.220		0.770	
	1.120	1.120	1.148	1.148	1.220	1.220	0.770	0.770
Protein	6.38		6.54		6.95		4.38	
Nx5.7	6.38	6.38	6.54	6.54	6.95	6.95	4.38	4.38
Trial No. 3	1.120		1.148		1.175		0.812	
Nitrogen	1.120	1.120	1.148	1.148	1.175	1.175	0.812	0.812
Protein	6.38		6.54		6.70		4.62	
Nx5.7	6.38	6.38	6.54	6.54	6.70	6.70	4.62	4.62

Method No. 2.

Sample Number	1		2		3		4	
	As Titr.	Average	As Titr.	Average	As Titr.	Average	As Titr.	Average
Trial No. 1	1.105		1.162		1.245		0.867	
Nitrogen	1.105	1.105	1.175	1.168	1.245	1.145	0.867	0.86[illegible]
Protein	6.30		6.62		7.10		4.95	
Nx5.7	6.30	6.30	6.70	6.66	7.10	7.10	4.95	4.95

Trial No. 2	1.110		1.130		1.220		0.860	
Nitrogen	1.110	1.110	1.130	1.130	1.220	1.220	0.860	0.860
Protein	6.33		6.45		6.95		4.90	
Nx5.7	6.33	6.33	6.45	6.45	6.95	6.95	4.90	4.90
Trial No. 3	1.110		1.140		1.200		0.850	
Nitrogen	1.110	1.110	1.140	1.140	1.200	1.200	0.850	0.850
Protein	6.27		6.50		6.84		4.85	
Nx5.7	6.27	6.27	6.50	6.50	6.84	6.84	4.85	4.85

Table No. 5. Protein on Flour Residues. Averages Only.

Method No. 1.

Sample Number	1	2	3	4
Trial No. 1, Nitrogen	0.78	0.70	1.12	0.56
Nx5.7	4.44	3.99	6.37	3.17
Trial No. 2, Nitrogen	0.79	0.71	1.09	0.58
Nx5.7	4.50	4.04	6.22	3.31
Trial No. 3, Nitrogen	0.79	0.705	1.13	0.55
Nx5.7	4.50	4.02	6.45	3.13

Method No. 2.

Sample Number	1	2	3	4
Trial No. 1, Nitrogen	0.81	0.69	1.08	0.51
Nx5.7	4.62	3.93	6.15	2.91
Trial No. 2, Nitrogen	0.80	0.72	1.10	0.52
Nx6.7	4.56	4.10	6.27	2.96
Trial No. 3, Nitrogen	0.81	0.715	1.10	0.52
Nx5.7	4.62	4.07	6.27	2.96

Table No. 6. Comparison of Results. General.

Sample Number	1	2	3	4
N x 5.7	10.33	10.52	11.76	7.57
N x 6.25	11.33	11.54	12.90	8.31
Dry Gluten, per cent	11.40	11.80	13.10	----
Method No. 1.				
Trial No. 1	10.55	11.50	12.98	7.61
Trial No. 2	10.49	11.36	12.71	7.86
Trial No. 3	10.61	11.47	12.85	7.77
Method No. 2.				
Trial No. 1	10.40	11.49	12.65	8.06
Trial No. 2	10.71	11.76	12.48	7.94
Trial No. 3	10.87	11.51	12.85	7.81
Average, six results	10.605	11.515	12.903	7.84

Table No. 7. Comparison of Results.

Proteins of Extracted Residues.

Sample Number	1	2	3	4
Method No. 1.				
Trial No. 1	6.33	6.525	6.75	4.56
Trial No. 2	6.38	6.54	6.95	4.38
Trial No. 3	6.38	6.54	6.70	4.62
Method No. 2.				
Trial No. 1	6.30	6.66	7.10	4.95
Trial No. 2	6.33	6.45	6.95	4.90
Trial No. 3	6.27	6.50	6.84	4.85
Average, six trials	6.331	6.535	6.881	4.71
Gliadin	5.58	6.53	6.69	4.32

In comparing the tabulated results it will be seen that there is undoubtedly a quantitative separation of the constituents of the flour. Also that any amount of acid seems to dissolve about the same amount of the flour. This was more noticeable in the preliminary work where the amounts of acid and time of extraction was varied more than in the work on this paper. Quoting further from the article of Marchadier and Goujon, they

make the statement that "Comparative experiments on the same sample by different operators, and including the old method, show deviations of only 0.2 per cent in the results of the proposed method. Determination of the nitrogen in the flours employed and calculating gluten as 6.25xN, gives results about 1 per cent too high, due to the presence of about 1 per cent of other nitrogenous, non-glutinous substances, i. e., leucosine and edestine."

In several instances in the experiments results were obtained that varied much more than this amount, but many checked even closer, and from observations it could be said that careful standardized work will give quite close checks. In the patent wheaten and in the rye flour the results obtained by the acetic acid extraction seem to check closer with the protein as calculated by the formula Nx5.7 than to the gluten as calculated by the formula Nx6.25. In the straight and clear grade flours just the reverse is the case.

Of more striking similarity is the comparison of the results obtained by the determination of the protein on the extracted residue to the results obtained for gliadin by the alcohol solubility method. There is much less variation in these results than in those where the total residue is weighed and calculated to percentage. The figures as given in Table No. 7 show the reverse of the results shown in Table No. 6, or that the percentages for the patent wheaten and rye flours are too high, while those of the other grades are too low.

The similarity of the results for gliadin and those of the protein in the extracted residues has given an impetus and curiosity for further experiments. In these experiments it will be under the assumption that there is a certain definite quantitative separation of the proteins of flour when extracted by glacial acetic acid and that by this method only the gliadin is removed from the flour. An attempt will be made to prove by experiment and chemical tests that the protein extracted is gliadin or some protein or class of proteins. It will be attempted to isolate these and classify them by definite tests. This assumption may be far from correct, but the fact that there is a similarity between the results as obtained warrant further experiment on the subject and as the Kjeldahl determinations have almost positively proven that the method as suggested is practically worthless, further experiments on the assumption of Marchadier and Goujon would hardly be of any value.

First suggestion to be made under precautions is to standardize all operations. When centrifuging samples the stirring rods should be removed as they hinder when decanting and often cause breakage of tubes. In decanting care should be taken to prevent part of sample washing into crystallizing dishes and also to prevent loss of acid by creeping. Decantation should be made very slowly and carefully, with end of tube well into dish. When adding acid to tubes, pour it down the side of the tube and have tube rotating in the hand. This is the best method for washing down sides of the tubes.

During the evaporation samples should only simmer, as hot acetic acid will creep up over the sides of the dishes. Samples should always be removed from the hot plate and placed in drying oven just before disappearance of the liquid, as the residues char very easily. Close watching is very essential as evaporation nears an end.

The colors of the residues obtained in this way are not as would be expected. They vary from a very light opalescent brown in the patents to an opaque brown in the lower grades of flour. By avoiding a too rapid evap-

oration and stopping the operation soon enough the colors may be obtained ni very light shades of brown that vary closely to the yellow natural color of glutens.

The color graduation appears to be a fairly effective method of determining the grade of flours. By running a flour by this method, with flours of known grades, its grade can be quite accurately established when all operations are carefully standardized. It appears to be a better indication of the percentage extraction of the flour than any other method, as it gives in colors what is sometimes misleading in percentages as expressed in the ordinary analyses of flours. With careful work the gluten obtained in this way has much the same color, with the differences in grades, as with the color obtained by washing and when the gluten is still wet. However, this method gives a more constant value in color than can be obtained where the gluten is washed as the washing method cannot be staandardized to the fine point that this method reaches.

VI.

The accuracy of the method as a means of determining gluten seems to be well disproven. All analyses tend to indicate that it is not a separation of the total proteins, true glutens, or a pure gluten in any form. The Kjeldahl determinations on the residues extracted by the acetic acid fairly well show that the residue is not a pure gluten or protein as in no instance it was possible to get a sufficient percentage of nitrogen that would make the equivalent of protein supposedly present.

By determining the protein on the residue extracted by the acetic acid a percentage should be obtained that would be sufficient to check somewhere near the total protein as run on the original flour, or at leaśt to check with the results as obtained by the direct weighing of the residue which, according to the assumption of Marchadier and Goujon was a true pure protein. Then the analyses of the residues left after the extraction by the acetic acid show very plainly that not all of the proteins had been removed.

However there seems to be a very distinct quantitative separation made by the acetic acid and this percentage varies but little whether 20 or 30 cc. of the acid are used. In the experimental work done in the first experiments it was proven that the time element entered in so little that the time given the acid in both of the methods tested was sufficient to dissolve all of the material that would be dissolved by the acid. All conditions were not tested, as for instance, allowing the digestion to take place for long periods of time but the work done will show that the assumption that only true proteins are extracted by acetic acid cannot be adhered to longer.

But there does seem to be also a quantitative separation of the proteins. There has not been time to separate and identify by chemical tests the proteins removed by the acetic acid but comparing results and drawing conclusions from them it would appear that the protein dissolved by the acid was either gliadin alone or a combination of the gliadin and amino acids. Many of the results indicate that this would be only the gliadin while others show that the percentage of gliadin obtained by the usual alcohol extraction is less than the quantity obtained by the acid extraction. Further proof that there is a distinct separation of the proteins by the acid is that the amount extracted by the various amounts of acid does not vary as much as the other results. This would tend to indicate that only a certain protein or proteins can be removed by the acid and that even the smaller amount of acid used is sufficient to

remove all of these protein or proteins present.

The method is of no value as a routine feature both on account of the time necessary to make a determination and the disagreeableness of the method. If it can be proven that a protein or group of proteins are extracted by the acid, then the method becomes of importance in special flour analysis for the separation of the proteins.

It is certain that the method is accurate when properly handled and standardized. But to what use this accuracy can be put has not been determined. Further experiments will be conducted to further prove the assertions made as to accuracy and quantative value and an effort will also be made to identify and classify the protein extracted.

VII.

In suggesting methods it is undoubtedly safe in saying that method No. 1 as outlined is sufficient for the total extraction of both the soluble part of the flour and also for the protein extracted. This method is shorter than Method No. 2 and can be easily gotten out in the course of the days work. Would suggest no variation of this method as given.

It would no doubt be of advantage to have a centrifuge run by an electrical motor so that the operations could be further controlled and the centrifuge run at the same speed, though this does not seem to cause the variation of the results as much as the evaporation of the acid. For the evaporation and drying of the sample it would be well to use a water bath oven with jacket filled with a higher boiling liquid than water. No doubt toluene would do very well, as this is used to quite an extent in ovens for moisture tests. The toluene is generally mixed with enough water to bring the boiling point down to the required degree. Several other liquids could be used that would have no corrosive effect on the jacket of the oven and would be cheap enough to permit of their use. In case any of these liquids are used the water bath should be connected to a reflux condenser so that none of the liquid would be lost and then the same amount of the reagent could be maintained in the jacket.

VIII.

A suggested method for the separation of gluten from flour by extraction with glacial acetic acid has been tested.

The work done and experiments performed have conclusively shown that the method is inaccurate as it will not separate the total protein or glutens from flour and will not extract a pure protein or gluten.

The method has been shown to be of no value to the routine work of cereal laboratories on account of its disagreeableness, lengthy and tedious procedure and inaccuracy.

The results obtained would tend to indicate that a quantitative separation of the proteins of flour can be made by extracting with glacial acetic acid.

The accuracy of the quantitative separation of the proteins has been fairly well established, but no attempt has been made to isolate or identify the proteins so separated. Any assumptions made during the course of the work are only on the results as stated and are intended for further study and not as bearing on the subject matter as submitted.

Some of the proposed procedure has been proven to be impracticable and where possible new methods have been suggested.

S. J. LAWELLIN.

The Association of Official Agricultural Chemists have just published for distribution "The Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists." Revised to Nov. 1, 1919.

CALCULATION OF B. T. U. OF COAL FROM APPROXIMATE ANALYSIS

Goutal, who gives the carbon a fixed value and considers the heat value of the volatile matter a function of its percentage referred to combustible, has evolved the following formula:

B. T. U. = 14,760 C plus AV in which C = percentage of fixed carbon in coal; A = variable depending on ratio R of volatile matter to combustible; V = percentage of volatile matter in coal.

The value A corresponding to R for several values of V and C are given in the following table:

$R = \frac{V}{V \text{ plus } C}$	A
.05	26,100
.10	23,400
.15	21,060
.20	19,620
.25	18,540
.30	17,640
.35	16,920
.38	15,300
.40	14,400

Applying this formula to the same coal as in the preceding example, C = 58, V = 32; therefore

$$R = \frac{.32}{.58 \text{ plus } .32} = .35;$$

hence A = 16,920, and the B. T. U. per pound of coal is: 14,760 times .58 plus 16,920 times .32 = 13,975.

Have checked with a Parr's Calorimeter and found it to be 200 – 300 B. T. U. less in every case, which is close enough for most purposes.

M. E. SCHULTZ.

The Association of Operative Millers is compiling some important data regarding tempering, milling and analysis of the 1920 wheat crop. The official methods of the American Association of Cereal Chemists will be used in all analytical work.

ABSTRACTS

"New Bread Making Method."

A patented process assigned to Ward Baking Co., New York, consists in adding to yeast, flour and other ingredients of the dough batch, yeast saving and dough maturing salts, together with a product containing diastic and proteolytic enzymes produced by the action of a fungus upon carbohydrate and protein substances.

"Standardization of Feeding Stuffs."

Paper with the above title presented by Dr. Anthony McGill, Chief Analyst of the Department of Health of Canada, before the 36th annual convention of the Association of Agricultural Chemists at Washington, D. C., November, 1919. Advocates legal, fixed, minimum values of feed constituents and that feeds be sold without specific individual guarantee.

Bureau of Crop Estimates announces that the weight per measured bushel of 1919 crop wheat is 56.3 pounds compared to 58.8 pounds for the 1918 crop and 58.2 pounds for the ten year average.

"Buttermilk Bread."

With the discovery of condensing buttermilk to an ice cream consistency, eight to ten pounds of which added to each barrel of flour is said to increase palability and to greatly increase food value.—Modern Miller, Sept. 6, 1919. p. 40.

"Baking Qualities of Flour Made From 1919 Wheat."

Spring Wheat Flour discussed by Chas. H. Briggs.

Red Winter Wheat Flour discussed by L. M. Thomas.

Hard Winter Wheat Flour discussed by A. W. Estabrook.—Northwestern Miller, Nov. 26, 1919. p. 954.

"Bran as Human Food."

Remarks on investigations of U. S.

D. A. regarding digestibility of bran, by Harry Snyder.—Northwestern Miller, Sept. 10, 1919. p. 1107.

"Wheat at Its Best."

Results of investigations by K. S. A. C. Wheat cut in prime condition has more moisture and less ash than wheat cut either under ripe or over ripe. More dry and wet gluten in wheat cut under ripe. Gluten from wheat cut in prime was gray, yellow and harder than is best. Gluten from over ripe wheat was darker and harder, while gluten from under ripe was yellow and softer.—American Miller, Sept. 1, 1919. p. 826.

"Single Deflection Method of Weighing."

Paul H. M.-P. Brinton, J., Am. Chem. Soc., 41, 1151-55 (1919). This is a method for eliminating much of the tediousness and time when many routine weighings are made. The method is as follows:

"The balance is given a permanent overload on the left arm by screwing the adjusting nut on the end of the beam until when the beam and pans are released the pointer will swing out from 3 to 7 scale divisions to the right. The pan arrests must be so adjusted that there is no lateral vibration of the pans when released. Before determining the zero point the stability of the pans is assured by moving the pan arrest button in and out a few times. The beam is then freed and the pans are next released by a gentle, steady motion. The pointer will swing out to the right, and the turning point of this single excursion is taken as the zero point. To obtain the weight of any object it is only necessary to add weights until the pointer is caused to swing out to the same point on the ivory scale. The convenience and rapidity of the method were immediately apparent, but grave doubts were entertained as to its practicability until confidence was established by critical investigation."

The author follows with a discussion of the Constancy of Deflection, Behavior with Various Loads, Precautions and Limitations. He also gives in detail the method for testing the accuracy of the balances under conditions of usage.

The method is especially applicable to the weighings made in the routine work of the cereal laboratory where many weighings are made that should be made with the greatest rapidity and care. It is suggested that, for the work of the cereal laboratory where weighings are generally made with a definite weight of sample, the permanent overload be placed on the right arm of the scale. The advisability of this will be at once seen, as where the definite weight of sample is taken the weights are all placed on the scale pan and the material being weighed is added until the correct amount has been placed on the scale.

"Influence of Electrolytes Upon the Viscosity of Dough."

L. J. Henderson, W. O. Fenn and E. J. Cohn (Jour. Gen. Physiol., 1, 1919, No. 4, pp. 387-397; abs. in E. S. R., 41, p. 169.)

The effect of H-ion concentration and of salts upon the viscosity of dough was determined by measuring the resistance of a definite amount of dough to stirring when packed in a torsion viscometer. It was found that with variation in H-ion concentration viscosity passes through a minimum a little on the acid side of *pH5*. The addition of a small amount of salt to dough diminished viscosity, while as the concentration of the salt increased there was commonly a later rise in viscosity. Of the salts studied, the sulphates of sodium and magnesium had the most marked effect. The influence of salts upon viscosity was found to vary with the H-ion concentration. At a more acid range

of reaction sodium chloride depressed the viscosity greatly, while calcium chloride lowered the viscosity in a less acid range.

"The results are thought to indicate that in bread making the action of acids, bases and salts, perhaps with the exception of potassium bromate, is favorable chiefly through the effect upon viscosity, and that any influence upon the activity of yeast is apparently a matter of secondary importance."

E. S. R., 41, p. 169.

SOME NITROGEN DETERMINATIONS

In making nitrogen determinations it is considered necessary that sufficient quantity of standard acid be used to neutralize all ammonia which distills and leaves the acid in excess. It often happens that the substance under examination contains more nitrogen than is expected and the distillate be alkaline. In order to throw light upon the accuracy of such conditions the following determinations were made:

The selected sample was a straight grade flour, kept in a Mason jar with screw top and it is believed that any variation due to moisture was avoided. The determinations were made on 1 gram according to the official Kjeldahl Method, A. O. A. C. bulletin 107 (revised) except that 250 cc. water used in diluting acid, and the ammonia distilled into 100 cc. of distilled water plus the amount of standard acid shown. 190 to 200 cc. were distilled in from 30 to 33 minutes and the temperature of all distillates between 32 degrees and 34 degrees C.

Number of Determinations	CC of N/10 H_2SO_4 to Catch Distillate	CC. of N/10 H_2SO_4 to Neutralize Distillate	CC. of N/10 Na OH to Neutralize Distillate	Total CC of N/10 H_2SO_4 Used	Protein (N x 5.7)	Percentage Error
5.	20.	0	4.4	15.6	12.45	Max. 64 Av. none Min. 64
5.	15.	0.7	0	15.7	12.53	Max. 64 Av. 64 Min. none
5.	10	5.55	0	15.55	12.41	Max. none Av. 32 Min. 64
5.	5.	10.55	0	15.55	12.41	Max. none Av. 32 Min. .64
10.	0	15.4	0	15.4	12.29	Max. none Av. 1.28 Min. 2.56

The average of each set is shown and the percentage error is calculated from the average of the first five, which contained an excess of acid in the distillate. The highest and lowest figures of each set were calculated as maximum and minimum errors in relation to this average.

It is thought that under these conditions all ammonia need not necessarily be neutralized during distillation in order that the determinations be accurate.

DEAN YOHE.

ELECTRIFIED SEEDS

During the 1918 harvest in Great Britian some remarkable results were obtained from "electrified seeds.' H. E. Fry, an electrical engineer in

Dorset, England, has developed a process of stimulating seeds so that they yield healthier and more prolific crops. The process consists of soaking the seeds in a solution of common salt, sending a current of electricity through the solution, and subsequently drying the seeds.

Trials have been made with electrified wheat, barley and oats in comparison with non-electrified seeds from the same sack and sown on adjoining ground. The electrified seeds threw up more straws which were so much stronger than the normal that they withstood storms that laid the non-electrified harvest low.

The gain in yield per acre varied in different parts of the country from nearly 5 to nearly 20 bushels per acre for oats, and from about 5 to 7 bushels for wheat. Barley showed an increase of 16 bushels in another recorded case. Twenty-seven farmers in South Devon realized an average gain of 4 pounds, 13 shillings after deducting the cost of treatment, which is only a few shillings per sack.

Thus the latest British contribution to the promising science of electro-culture is being investigated by the sub-committee of the Board of Agriculture of Great Britian which is making a scientific study of the influence of electricity on plant life.—Manitoba Free Press, in Northwestern Miller, March 12, 1919.

CORRECTION

In the article on The Auto Digestion of Yeast, July number, 1919, this Journal, it was stated in the conclusion and elsewhere in the article that when yeast is digested with water at a temperature of 40 degrees C. for twenty-four hours, 81 per cent of its total nitrogen will be liberated from the cell. It should read when yeast is digested with water *containing chloroform* at a temperature of 40 degrees C. for twenty-four hours, 81 per cent of its nitrogen will be liberated. While chloroform was mentioned in the method given in the article it should have been mentioned again in the summary, as without the use of chloroform the digestion would have progressed very slowly.

It is evident that autolysis begins as soon as the cell is dead and the enzymatic activity has been preserved, this being the case when antiseptics such as chloroform, toluene, etc., are used . P. Vansteenberge (Ann. inst. Pasteur 31, 601-30, 1919), states that immediately after the death of the yeast cell it loses its cell fluid and becomes much smaller.

Mr. R. E. Lee, of the Fleischmann Co., has stated it would take several weeks to acomplish the same result as above stated without the use of chloroform.

The writer wishes to thank Dr. Lee for this suggestion, as it is a very important one.

A. R. Sasse.

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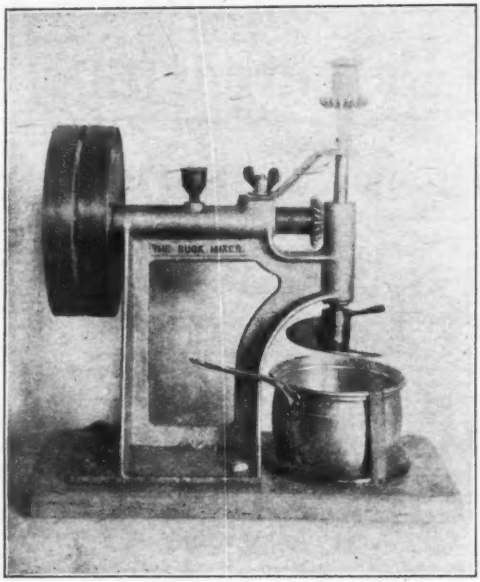

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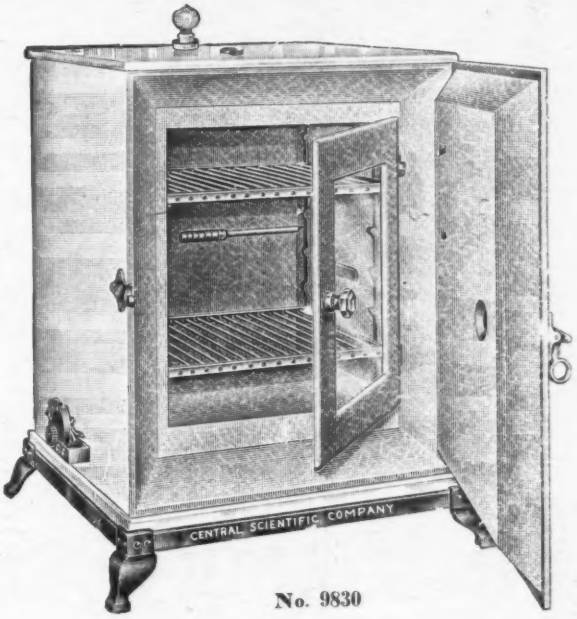

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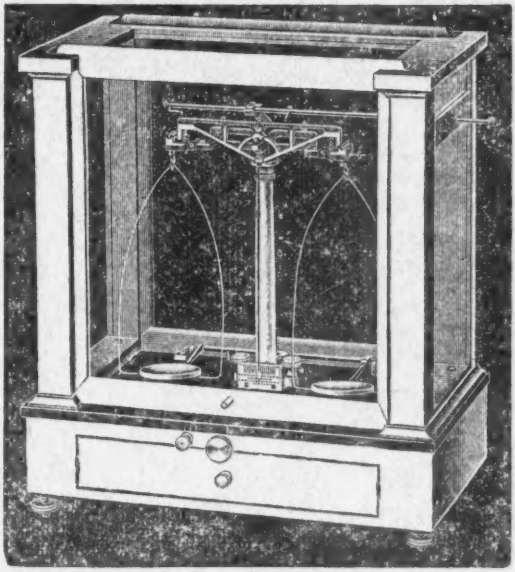

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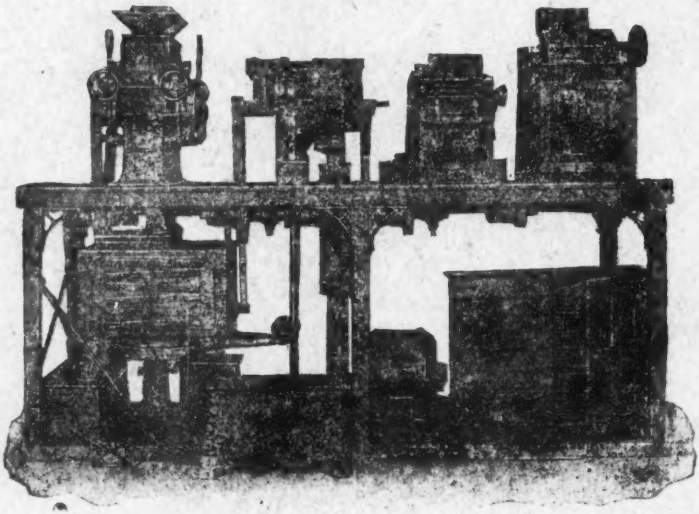

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